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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 :
B01L 3/06 // B01F 13/08, 15/06

A1

(11) International Publication Number: WO 99/13988

(43) International Publication Date: 25 March 1999 (25.03.99)

(21) International Application Number: PCT/EP98/05901

(22) International Filing Date: 17 September 1998 (17.09.98)

(30) Priority Data:
9719774.3 18 September 1997 (18.09.97) GB

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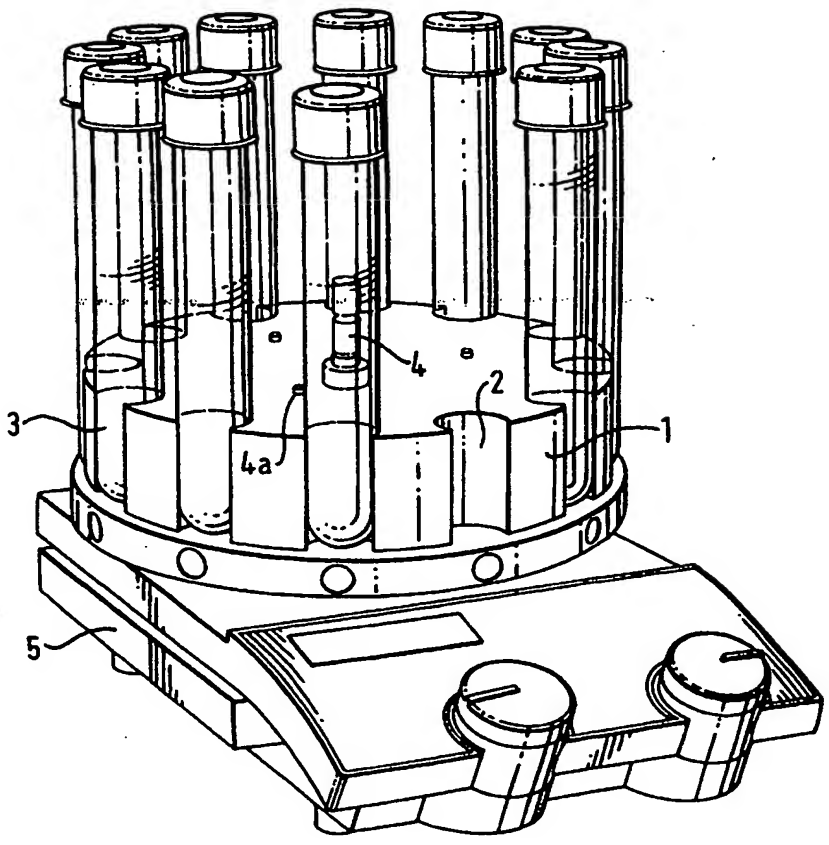
(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, HR, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published
With international search report.
Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.

(54) Title: PARALLEL REACTION STATION WITH MAGNETIC STIRRING

(57) Abstract

The present invention relates to a reaction station for performing parallel synthesis. Particularly, the device is capable of accommodating a plurality of reaction vessels being specifically adapted so that when placed in a magnetic field, such as that generated by a laboratory magnetic stirrer, any reaction vessel accommodated by the device is in an effective position for stirring with respect to the magnetic field.



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PARALLEL REACTION STATION WITH MAGNETIC STIRRING

The present invention relates to a device capable of accommodating a plurality of reaction vessels being specifically adapted so that when placed in a magnetic field, such as that generated by a laboratory magnetic stirrer, any reaction vessel accommodated by the device is in an effective position for stirring with respect to the magnetic field.

In the field of organic chemistry it is often desirable to perform a variety of related chemical reactions simultaneously under similar reacting conditions. The technique for performing such reactions simultaneously is known as parallel synthesis.

One of the problems associated with carrying out parallel syntheses in the laboratory is that the majority of existing laboratory magnetic stirrers are only designed to accommodate and efficiently stir the contents of one reaction vessel at any one time. Accordingly, such equipment is not suitable for use in parallel synthesis.

Laboratory magnetic stirrers specifically designed for use in parallel synthesis are known. However, such apparatus, conventionally known as parallel reaction stations are only available as complete units incorporating a source of magnetic flux together with a frame for accommodating reaction vessels. These units are very costly in comparison to laboratory magnetic stirrers. The present device is advantageous over known devices in that it allows a conventional magnetic stirrer to be used for parallel synthesis and hence provides significant economic advantages compared with parallel reaction stations.

A means has now been found which permits the use of existing laboratory magnetic stirrers in parallel syntheses by providing a device which is capable of securely accommodating a plurality of reaction vessels said device being specifically adapted so that when correctly located within a magnetic field generated by a laboratory magnetic stirrer each and every reaction vessel is effectively positioned for stirring with respect to the magnetic field. Thereby, any

reaction vessel, placed in the device and equipped with a magnetic stir bar, is subject to smooth and efficient agitation.

Thus, the present invention provides a device comprising an adapter block, the adapter block containing fixing means for holding a plurality of reaction vessels, wherein when the adapter block is co-operatively positioned within a magnetic field generated by a laboratory magnetic stirrer each and every position for holding a reaction vessel is effectively located for stirring with respect to the magnetic field. Preferably, the fixing means will comprise a plurality of sockets each designed to securely accommodate a reaction vessel.

Optionally the device may incorporate guide means which engage with the laboratory magnetic stirrer thereby ensuring the adapter block is correctly located within the magnetic field of the laboratory magnetic stirrer such that each and every position for holding a reaction vessel is effectively located for stirring with respect to the magnetic field. Suitably the guide means will ensure the adapter block is effectively positioned such that each and every position for holding a reaction vessel is effectively located for equivalent stirring with respect to the magnetic field. Preferably, the guide means comprises a raised rim around a central recess.

The adapter block may be cast in any suitable form, however in a particularly preferred arrangement the adapter block is circular in shape. The adapter block may be used in co-operation with any laboratory magnetic stirrer with a suitable circular magnetic/hotplate. Preferred laboratory stirrers include the IKA RCT basic hotplate stirrers, the IKAMAG REO, the Heidolph MR3001, the Heidolph MR3002, and the Heidolph MR3000.

The sockets for securely accommodating the reaction vessels may be located at any position on the device in which they are effectively positioned for stirring with respect to the magnetic field. In a particularly preferred arrangement the sockets are arranged about the perimeter of the adapter block.

Preferably the adapter block is made of chemically resistant material for example PTFE or a metal such as aluminium or stainless steel.

Figure 5 is a plan view of the condenser unit.

Figure 6 is a cross-section of the condenser unit along line A.

The device illustrated in Figure 1 comprises the adapter block (1) which is constructed from PTFE and is circular in shape with sockets (2) suitable for securely accommodating the test tube reaction vessels (3) located about the perimeter of the device. One face of the device is equipped with a central recess whereby the stirrer plate of the magnetic stirrer (5) is secured within the recess thereby ensuring that the device is effectively located for stirring within the magnetic field. A gas manifold comprising a gas inlet (4) and gas outlets (4a) is located at the centre of the adapter block.

Figures 2 and 3 show the location of the gas inlet (4) and gas outlets (4a) more clearly. Figure 3 illustrates the central recess (5a) formed by the raised rim (5b) which ensure the adapter block is correctly located within the magnetic field of the laboratory stirrer.

The device shown in Figure 4 comprises an adapter block (11) and a condenser unit (12) both of which are constructed from aluminium and are circular in shape. The adapter block comprises sockets (13) located about the perimeter of the device suitable for accommodating the test tube reaction vessels (14). The condenser unit contains openings (15) through which the test tube reaction vessels pass. The condenser unit is equipped with inlet/outlets (18) which permit cooling fluid to flow through the condenser unit. The adapter block and condenser unit are substantially parallel to one another. One face of the adapter block is equipped with a recess whereby the hotplate of a hotplate/magnetic stirrer (16) may be secured within the recess thereby ensuring that the adapter block is effectively located within the magnetic field. A gas manifold comprising a gas inlet (17) and gas outlets (17a) is located at the centre of the condenser unit.

The adapter block may optionally be constructed from heat conducting material for example aluminium or stainless steel. Thereby, when the device is used in co-operation with a hotplate/magnetic stirrer heat generated by the hotplate will be efficiently transferred to the reaction vessels accommodated by the device.

Preferably the adapter block or condenser unit will incorporate a gas manifold. Thereby, gas flow or vacuum supply to each of the reaction vessels may be individually controlled. The gas manifold may be located anywhere on the device, however in a particularly preferred arrangement the gas manifold is located at the centre of the parallel reaction station.

The adapter block is capable of being constructed to accommodate any size laboratory reaction vessel however 16 and 24 mm o.d. test tubes are particularly preferred.

Optionally the device may incorporate a condenser unit such that the contents of the reaction vessels may be heated to reflux. Suitably, the condenser unit will be assembled such that the unit is in direct contact with the reaction vessels as they project from the adapter block. Preferably the condenser unit will be constructed from a material of high specific heat capacity for example stainless steel. In a particularly preferred embodiment the unit is condenser liquid cooled.

Preferred embodiments of the invention are described in detail below, by example only, with reference to the accompanying drawings, wherein:

Figure 1 is a perspective view of the adapter block working in co-operation with a laboratory magnetic stirrer.

Figure 2 is a plan view of the adapter block.

Figure 3 is a cross-section of the adapter block.

Figure 4 is a perspective view of the adapter block together with a condenser unit working in co-operation with a laboratory magnetic stirrer.

CLAIMS

1. A device comprising an adapter block, the adapter block containing fixing means for holding a plurality of reaction vessels, wherein when the adapter block is co-operatively positioned within a magnetic field generated by a laboratory magnetic stirrer each and every position for holding a reaction vessel is effectively located for stirring with respect to the magnetic field.

2. A device according to claim 1 wherein the adapter block incorporates guide means to ensure that the device is effectively positioned with respect to the laboratory magnetic stirrer's magnetic field.

3. A device according to claim 2 wherein the adapter block incorporates guide means to ensure that each and every position for holding a reaction vessel is effectively located for equivalent stirring.

4. A device according to any of claims 1 to 3 wherein the fixing means comprise a plurality of sockets each designed to securely accommodate a reaction vessel.

5. A device according to claim 4 wherein the sockets are arranged about the perimeter of the adapter block.

6. A device according to any of claims 1 to 5 wherein the device incorporates a condenser unit.

7. A device according to claim 6 wherein the adapter block is made of heat conducting material.

8. A device according to any preceding claim wherein the adapter block is circular in shape.

9. A device according to any preceding claim wherein the adapter block is made of chemically resistant material.

Figures 5 and 6 illustrate more clearly the cooling fluid inlet/outlets (18) the openings through the reaction vessels pass (15) and the gas inlet (17) and the gas outlets (17a).

In an additional embodiment of the invention the device comprises an adapter block as described hereinbefore wherein the device is permanently fixed to a laboratory magnetic or hotplate magnetic stirrer.

10. A device according to any preceding claim wherein the adapter block incorporates a gas manifold.

11. A magnetic or hotplate magnetic stirrer securely fitted with an adapter block wherein the adapter block contains fixing means for holding a plurality of reaction vessels, and wherein the adapter block is positioned within the magnetic field generated by the laboratory hotplate magnetic stirrer such that each and every socket is effectively positioned for stirring with respect to the magnetic field.

12. A magnetic or hotplate magnetic stirrer according to claim 11 wherein the device incorporates a condenser unit.

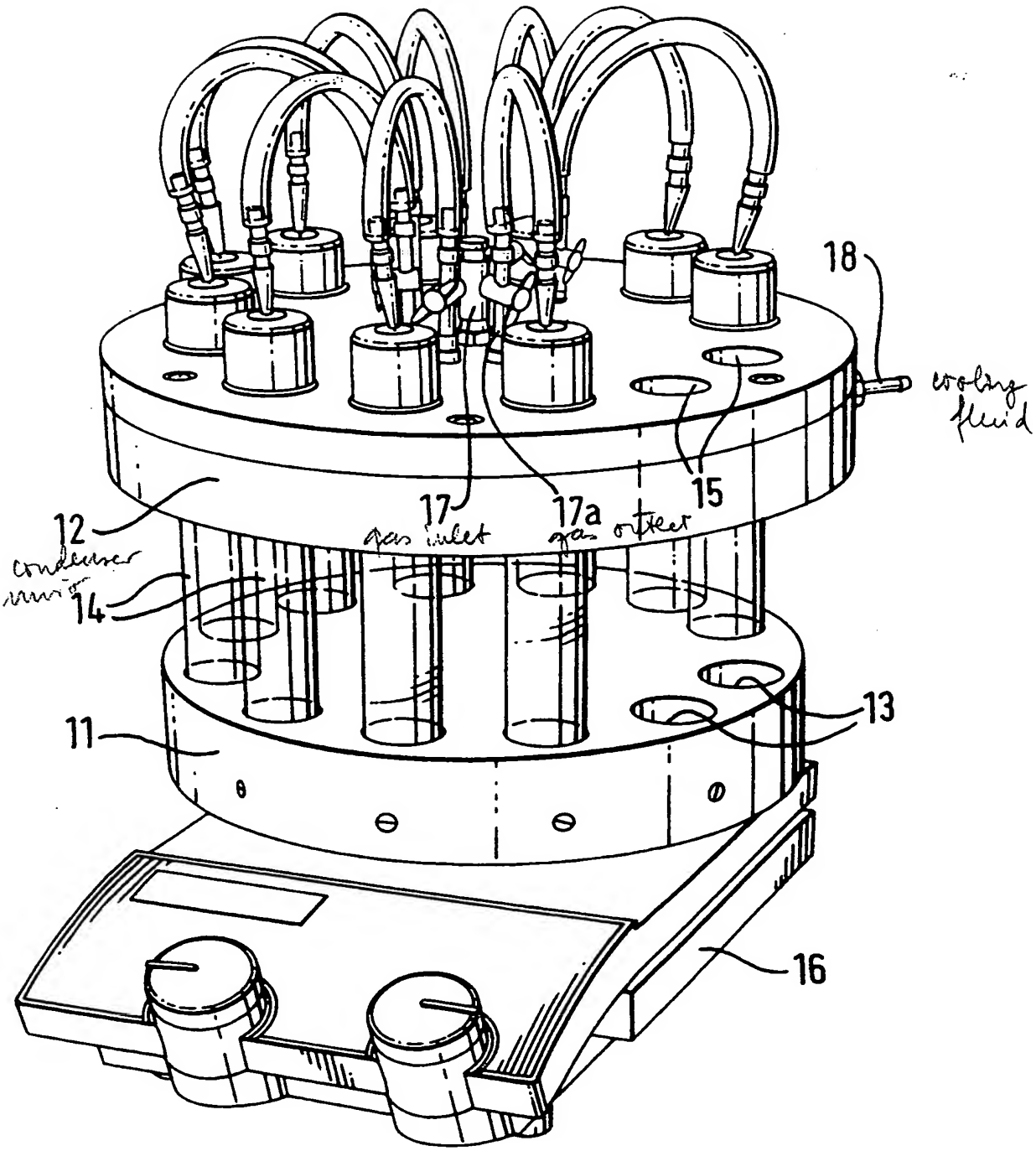
18
cooling fluid
15
17
gas inlet
17a
gas outlet
12
condenser
14
11
13
16

FIG. 4

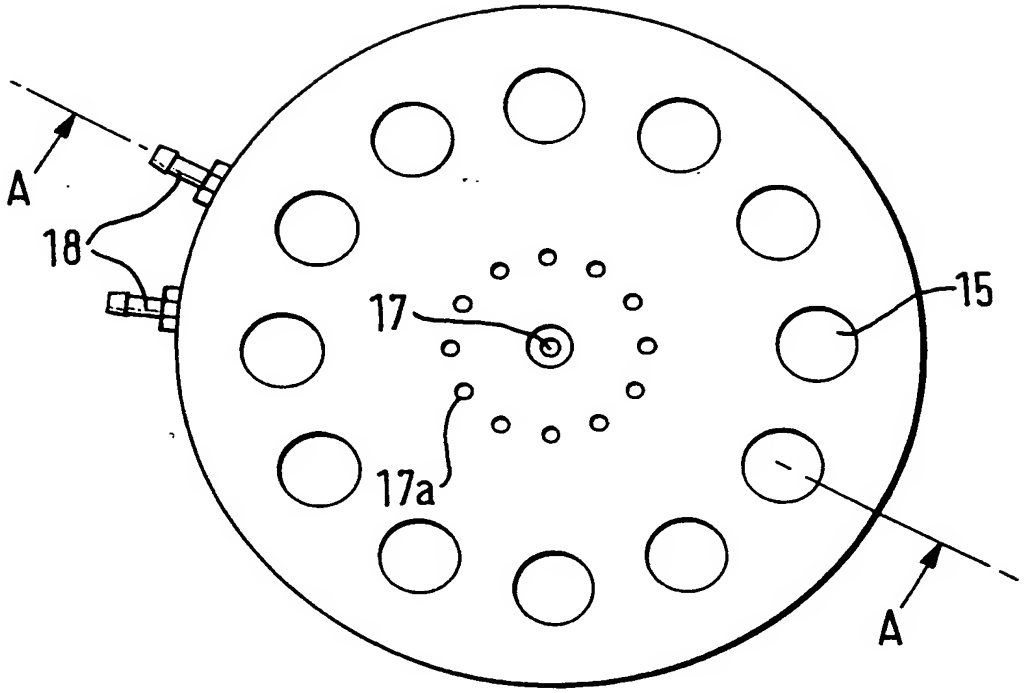

FIG. 5

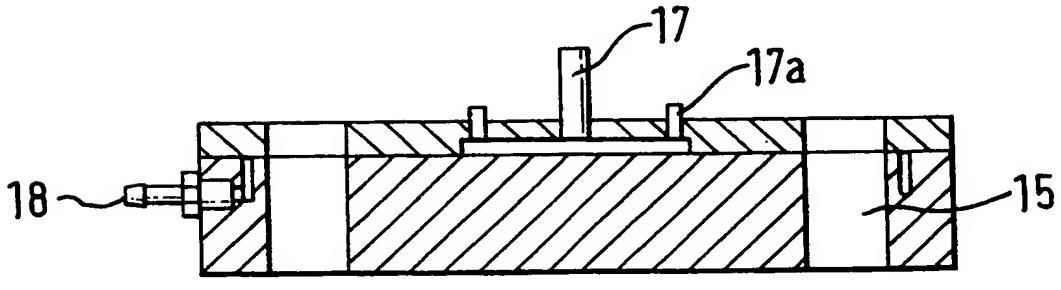

FIG. 6

INTERNATIONAL SEARCH REPORT

International Application No
PCT/EP 98/05901

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 B01L3/06 //B01F13/08,B01F15/06

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 G01N B01F B01L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 195 43 401 A (MIKROWELLEN SYSTEME MWS GMBH) 22 May 1997	1-5,8,9
A	see column 2, line 33 - column 5, line 64	11
A	see column 7, line 14 - column 7, line 30 see figures 1,2	7,10,12

X	US 5 529 391 A (KINDMAN L ALLEN ET AL) 25 June 1996 see column 2, line 4 - column 2, line 32	1-4,6,7,9
A	see column 3, line 16 - column 4, line 31 see figures 1-5	11

X	US 4 477 192 A (BONNEY WARREN J) 16 October 1984	1-4,6
A	see column 2, line 59 - column 3, line 11 see column 3, line 33 - column 4, line 32 see figures 1-5	12

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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